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BIOGRAPHY.

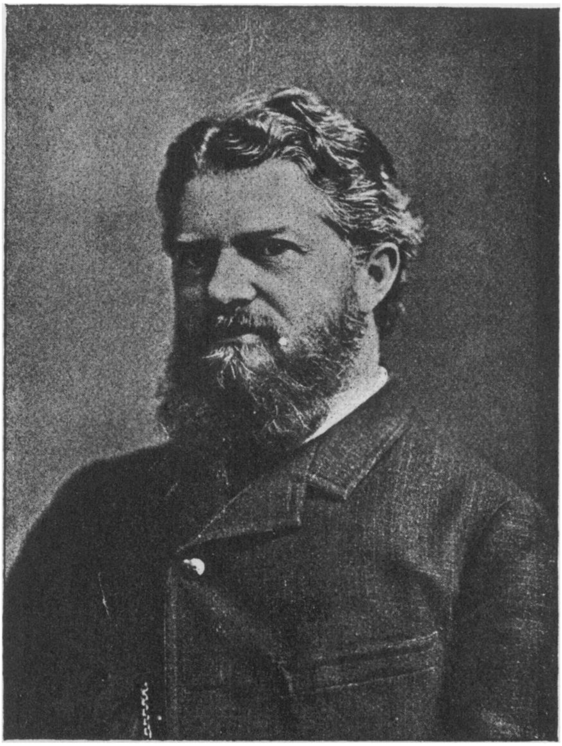
SIMON NEWCOMB, PH. D., LL. D.

BY J. M. COLAW.

SIMON NEWCOMB was born in Wallace, Nova Scotia, in 1835. After being educated by his father he engaged for some time in teaching. He came to the United States in 1853, and was engaged for two years as a teacher in Maryland. There he became acquainted with Joseph Henry and Julius E. Hilgard, who recognizing his aptitude for mathematics, secured his appointment in 1857 as computer on the "Nautical Almanac," which was then published in Cambridge, Mass. In Cambridge he came under the influence of Professor Benjamin Peirce. He entered the Lawrence Scientific School and was graduated in 1858, continueing thereafter for three years as a graduate student.

In 1861 he was appointed professor of mathematics in the U. S. Navy and assigned to duty at the U. S. Naval Observatory in Washington. There he negotiated the contract for the 26-inch equatorial telescope authorized by congress,supervised its construction and planned the tower and dome in which it is mounted.

He was chief director of the commission created by congress to observe the transit of Venus on December 8, 1874. He visited the Saskatchewan region in 1860 to observe an eclipse of the Sun, and in 1870-1 was sent to Gibralter for a similar purpose. In 1882 he commanded an expedition to observe the transit of Venus at the Cape of Good Hope. Meanwhile in 1887 he became senior professor of mathematics in the U. S. Navy, and since that time has been in charge of the office of the "American Ephemeris and Nautical Almanac". Professor Newcomb has a large corps of assistants in Washington.



Simon Newcomb, Ph. D., LL. D.

In addition to these duties, in 1884 he became professor of mathematics and astronomy in Johns Hopkins, (succeeding the distinguished Sylvester, upon the departure of the latter to accept a professorship at Oxford), where he has had charge of the *American Journal of Mathematics.* However he is not now editor of that Journal, having recently severed his immediate active connection with the Johns Hopkins University for the next two or three years.

Professor Newcomb has been intimately associated with the equipment of the Lick observatory of California, and examined the glass of the great telescope and its mounting before its acceptance by the trustees.

The results of his scientific work have been given to the world in more than one hundred papers and memoirs. Concerning these, Arthur Caley, president of the Royal Astronomical Society of Great Britain, said: "Professor Newcomb's writings exhibit, all of them, a combination on the one hand of mathematical skill and power and on the other of good hard work, devoted to the furtherance of astronomical science."

His work has been principally in the mathematical astronomy of the solar system, particularly Neptune, Uranus, and the Moon, but the whole plan includes the most exact possible tables of the motions of all the planets. Amongst the most important of his papers are: "On the Secular Variations and Mutual Relations of the Orbits of the Asteroids" (1860); "An Investigation of the Orbit of Neptune, with general tables of its motion" (1874); "Researches on the Motion of the Moon" (1876); "Measure of the Velocity of Light" (1884); and "Development of the Purturbative Function and its Derivative in the Sines and Cosines of the Eccentric Anomaly, and in Powers of the Eccentricities and Inclinations" (1884).

In 1874 Columbian University of Washington conferred on him the degree of LL. D., and in 1875 he received the same degree from Yale, also from Harvard in 1874, and from Columbia College in 1887, while on the 300th anniversary of the founding of the University of Leyden in 1875, that institution gave him the degree of Master of Mathematics and Doctor of Natural Philosophy, and on the 500th anniversary of the University of Heidelberg in 1886 he received the degree of Ph. D. Besides the degrees just mentioned he received one from Edinburgh in 1891, one on the occasion of the tercentenary of the University of Dublin in 1892, and one from Paris on the tercentenary of Galileo's connection with the University in 1893.

He was awarded the gold medal of the Royal Astronomical Society in 1874 and in 1878 received the great gold Huyghens medal of the University of Leyden, which is given to astronomers once in 20 years for the most important work acomplished in that science between its awards. Besides the two gold medals mentioned Professor Newcomb received a third in 1890, the Copley medal, given by the Royal Society of England.

In 1887 the Russian Government ordered the portrait of Professor Newcomb to be painted for the collection of famous astronomers at the Russian observatory at Pulkowa, and also ordered to be presented to him a vase of jasper with marble pedestal seven feet high. The University of Tokyo has also presented him with two vases of bronze.

He was elected an associate member of the Royal Astronomical Society in 1872, corresponding member of the Institute of France in 1874, and foreign member of the Royal Society 1877; and he also holds honorary or corresponding relations to nearly all the European academies of Science. In 1877 he was elected one of the eight members of the council of the Astronomische Gesellschaft, an international astronomical society that meets once in two years. He was elected to the National Academy of Sciences in 1869 and since 1883 has been its vice president. In 1876 he was elected president of the American Association for the Advancement of Science, and delivered his retiring address at the St. Louis meeting in 1878. He also held the presidency of the American Society for Physical Research.

He was elected member of the New York Mathematical Society in 1891, and delivered an address, entitled "Modern Mathematical Thought" before the annual meeting of the Society, December 28, 1893, which was published in the *Bulletin* of the Society for January 1894, and in *Nature* of February 1, 1894.

Professor Newcomb's book on Popular Astronomy (1877) has bëen republished in England and translated into German, while "School Astronomy" by Newcomb and Holden (1879), and their "Briefer Course" (1883), are used as text books in most of our colleges.

Professor Newcomb has also carried on important investigations on subjects purely mathematical. An important contribution by him on "Elementary Theorems Relating to the Geometry of a Space of Three Dimensions and of Uniform Positive Curvature in the Fourth Dimension", was published in Borchardt's Journal, Berlin, 1877. Full extracts of this important cotribution to non-Euclidean geometry are given in the Encyclopaedia Britannica, article "Measurment". In Vol. I. of the American Journal of Mathematics he has a note "On a Class of Transformations which Surfaces may Undergo in Space of more than Three Dimensions," in which he shows, for instance, that if a fourth dimension were added to space, a closed material surface (or shell) could be turned in side out by simple flexure without either stretching or tearing. Later articles have been on the theory of errors in observations. In former years he also contributed to the Mathematical Monthly and the Analyst.

He has also written a series of mathematical text-books, comprising Algebra (1881); Geometry (1881); Trigonometry and Logarithms (1882); School Algebra (1882); Analytic Geometry (1884); Essentials of Trigonometry (1884); and Calculus (1887). These works have been favorably received and are everywhere regarded as text-books of decided merits.

Professor Newcomb refers to astronomy as his profession and to political economy as his recreation, and in the latter branch has written several books and a number of magazine articles.

[In the main the foregoing sketch is taken from Appleton's Cyclopaedia of American Biography, Vol. IV., New York, 1888, but some statements have been incorporated from "The Teaching and History of Mathematics in the U. S., by Professor Florian Cajori (1890), to which has been added such matter as was necessary to bring the sketch down to date.]

SOME GENERAL FORMULAS FOR SQUARE NUMBERS WITH APPLICATIONS.

By Professor P. H. PHILBRICK, M. S., C. E., Lake Charles. Louisiana

Let us first examine the Formula, $(m^2+n^2)^2=(m^2\mp n^2)^2+(2mn)^2$.....(1).

This is identically true for all values of m and n and expresses one square number as the sum of two other square numbers. Give m and n different values and find as follows:

m	n		m	n	
2	1	$5^2=3^2+4^2$	5	1	$26^2=24^2+10^2$
2	1	$10^2=8^2+6^2$	5	2	$29^2=21^2+20^2$
3	2	$13^2=5^2+12^2$	5	3	$34^2=16^2+30^2$
4	1	$17^2=15^2+8^2$	5	4	$41^2=9^2+40^2$
4	2	$20^2=12^2+16^2$			
4	3	$25^2=7^2+24^2$			

In reference to this formula. we remark that in order to produce all possible sets of numbers answering to the conditions, the numbers of no set being equimultiples of those of any other set, then evidently m and n must be prime numbers and cannot both be even.

Moreover m and n cannot both be odd, for in that case m^2+n^2, m^2-n^2, and $2mn$ would all be even, and of the form $2(m^2_1+n^2_1)$, $2(m^2_1-n^2_1)$ and $2(2m_1n_1)$, and would give numbers twice as large as the values m and n would give. This is shown above; for $m=3$, $n=1$; $m=5$, $n=1$; etc.

Hence, m and n are both prime, one is odd the other even.

Hence, m^2+n^2 and m^2-n^2 are both odd and $2mn$ is even.

For all sets of values, we have the following *General* formula:

$[p(m^2+n^2)]^2=[p(m^2-n^2)]^2+(2pmn)^2$....(2), in which m and n are prime numbers, one of which is odd and the other even, and p any number. Let $m=2$ and $n=1$; then

$p=2$ gives $10^2=6^2+8^2$ $p=3$ gives $15^2=9^2+12^2$
$p=4$ gives $20^2=12^2+16^2$ $p=5$ gives $25^2=15^2+20^2$, etc.

None of these sets could be given by (1) m and n being prime, and one odd, the other even; and all sets given by (2), p being any number not 2 or a square, could not be given by (1) at all.

II. To find three square numbers, whose sum is a square number.